

# (19)The Korean Intellectual Property Office (KR) Unexamined Patent Application (A)

(51) Int.Cl. 6

F25D 23/00

Application No	10-2003-0020960
Application Date	2003-04-03
Publication No	10-2004-0002483
Publication Date	2004-01-07
Priority Claims	JP-P-2002-00177722
Agent	Myeong-Sin Kim
	Ho-Seok Kim
Inventor	HATTORI, Takao
	OKADA, Daishin
	OIKAWA, Takumi
Applicant	KABUSHIKI KAISHA TOSHIBA
Examination	Requested
Title of Invention	REFRIGERATOR



## Abstract

The invention relates to refrigerator. And without requiring for administration the receiving chamber of the low oxygen atmosphere controlling the air atmosphere of the inside refrigerator with the CA (atmosphere controlling heattreatment atmosphere) is included the freezing storage (10) and cold storage space (5) the reduced pressure storage space (9) independently cooled by the cold air current are set up with these storages, and simultaneously, the shutable carrying box (19) is arranged within the storage and it makes the indirect cooling by the direct cooling by the cool air inflow or the seal possible, and when being done by the enclosure, the air of the space inside part is exhausted, it makes it possible to do to the state characterize to provide the refrigerator for planning the long-term preservation of the food.



## Representative Drawing(s)

Fig. 1



## Description

❖ Brief Explanation of the Drawing(s)

Figure 1 is a cross-sectional view of refrigerator showing 1 embodiment of the present invention

Figure 2 is a front view showing the supporting part of the reduced pressure storage space in fig. 1

Figure 3 is an enlarged vertical longitudinal sectional view of the main part of the reduced pressure storage space of fig. 1

Figure 4 is a cross-sectional view showing the withdrawal condition of the carrying box of fig. 3

Figure 5 is a cross-sectional view of the same part as fig. 3 showing another preferred embodiment of the present invention

Figure 6 is a schematic sectional view showing the embodiment of the other lid opening instrument of the present invention

Figure 7 is a cross-sectional view showing the openness of the upper side opening of the carrying box in fig. 6

Figure 8 is a schematic sectional view showing the invention, and, the embodiment of the other lid opening instrument.

\* The description of reference numerals of the main elements in drawings.

1: refrigerator body 4: inter-phase person.

5: cold room 9: temperature switching room.

11: the cooling device for cooling 12: the cooling device for freezing.

15: machine room 19, 39: carrying box.

20: transition room door 21: support frame.

22, 24: pulley 23: rail.

25, 45: cover 26, 46: spring.

27: seal packing 28: lid opening instrument.

28a: cover suppressor 29: guide.

29a: through-hole 30: vacuum pump.

31: exhaust pipe 33: steering wheel.

34: through hole 35: leak valve.

40: solenoid 41: operation bar].

47: pinion gear 48: rack.

## ■ Details of the Invention

### ■ Purpose of the Invention

#### ■ The Technical Field to which the Invention belongs and the Prior Art in that Field

The invention relates to the refrigerator including the low pressure chamber for preserving for a long time refrigerator, especially, the food.

It has the uplift of the concern about the concern about environment not only the diversification of the cold storage temperature or profitability recent, and refrigerator to the background in the tendency that the long-term preservation or the energy-saving of the food which is the objective function of the refrigerator inherent is considered important.

Generally, in the inside refrigerator, it is determined that it is many to gratuitously fall into disuse to deterioration by the progress of the retention period etc. even if it preserves of the food. The function of maintaining the peculiar taste or the nutrient of material, and the freshness through the long term when preserving of the food in order to remove waste called discard and it freshes, always maintain the groceries is requested.

Drying, and the copper oxide can be given as the blazing fire primary factor of the food. Conservation under the condition that there is little the temperature variation in drying and the humidity is high is effective. By the evaporation temperature of the cooling device set up in each disappointment temperature exclusive being increased and recording difference with the indoor air temperature the attach of frost to the cooling device is to the utmost written and drying is prevented. Moreover, the maintaining freshness improvement is possible about the vegetable with the drying protecting with the removal of the ethylene gas which is the aging hormone of the garden stuff.

Moreover, conservation by the CA (controlled Atmosphere ambient environment control) is so called known about the oxidation blocking, as to airborne, the oxygen of about 20% exists but it becomes same among the factor degrading the food including the oxidation of the maintenance of the fish or the meat, by blocking the food and oxygen with CA it can have the suppression of the absorption of the vegetable, microorganism, the activating inhibition of enzyme, and effect called the inhibiting oxidation of the keeping light and so, by this, fresh the oxygen can plan the improvement of conservation.

It confronted to block the contact with the oxygen. The contact had the method which was the simplicity of the etc. which packed in a vacuum in the bag in which fastener was the food adhered or it put into tupperware, it did in the general home. However, task was troublesome on all such occasions. By sealing the adsorber adsorbing the oxygen in moreover, package including snack etc. with the food deterioration was prevented but since being the tightness state without opening and shutting, the contact had effect. However, adsorber was saturated in the use at the openness at the inside refrigerator if the time passed. The food could endure against the practical long-term preservation.

### ■ The Technical Challenges of the Invention

An object of the present invention is to provide the refrigerator without requiring for administration the receiving chamber of the low oxygen atmosphere which is comprised of consideration of above statement is included, for planning the long-term maintenance of the food.

### ■ Structure & Operation of the Invention

In order to solve the subject, it stands alone with the freezing storage and cold storage space, and these storages and the invention of the refrigerator which is written in claim 1 sets up the reduced pressure storage space cooled by the cold air current. Simultaneously, the shutable carrying box is arranged within the storage and it makes the indirect cooling by the direct cooling by the cool air inflow or the seal possible. It is the thing it exhausts the air of the space inside part when doing to the enclosure, possible to do to the state.

The stores received in the reduced pressure storage space can be cooled with this configuration. Simultaneously, the oxygen content among the decompressive atmosphere is lowered with the pressure reduction within the carrying box. Therefore, the food and the oxygen receiving and preserves are blocked. The suppression of the breathing of the vegetable, the inhibiting oxidation of the keeping light, and the suppression of the enzyme activity and activity suppression of the aerobic microorganism are possible. The freshness of the enclosing stores is sustained and it can preserve for a long time.

When drawing out door with their configuration, the invention in claim 3 the written invention characterizes the it shuts tightly thing cover remains in the storage room space in claim 2 according to consulting opening and shutting setting up cover in the opening of the reduced pressure storage space as the thing moved up and down. Since it is drawn only moreover, the carrying box from refrigerator, the thing makes the using convenience of the task which receives the food and which user takes out good. Moreover, trimming including the cleaning or the washing of container etc. is facilitated.

After the food within the carrying box being cooled to the prescribed temperature, it is depressurized in the invention which is written in claim 4 to the thing which reduces the container in pressure to the prescribed input after it introduces the cooling cool air within the carrying box when closing the exclusive door of the reduced pressure storage space and cooling to the prescribed temperature. Therefore, it is possible for the long-term preservation among the low oxygen atmosphere with being rapidly cooled.

The invention which is written in claim 5 reduces the pressure within the carrying box pressure with the vacuum pump set up in the refrigerator outside and the thus connected exhaust pipe to the designated value between 50~200Torr. In case for the pressure within the carrying box, the designated value is, it characterizes to stop the drive of the vacuum pump.

If the receiving container is reduced pressure less than 200Torr, it can become with 10% this edge of the oxygen content under the atmospheric pressure and the breathing of the oxidation progress of the food or the garden stuff can be effectively suppressed. The bad effect of the etc. which bursts even in case of receiving the sealing pack food including the Retort Food etc. erroneously is sealed by heat by stopping the access of air if it becomes with moreover, 50Torr less than edge, can be prevented. Moreover, the pressure within the carrying box stops the drive of the vacuum pump if the pressure has in the range of the designated value. Therefore, it continues with number. Writes the actuating time of the pump and suppresses the energy consumption.

The invention which is written in claim 6 easily can perform the opening of the carrying box accompanied with the consulting opening the reduced pressure storage space to the possible with LTC thing which it does and which operates with the exclusive consulting opening and leaving the leak through hole of the carrying box open and it does to the atmospheric pressure.

Hereinafter, it illustrates for 1 embodiment of the present invention based on the drawing. Figure 1 is a cross-sectional view of the refrigerator about the invention. The inter-phase person (4) is set up in the external phase person (2), forming the outer ring of the refrigerator body (1) and inner side through the adiabatic material (3).

In the top part of the inter-phase person (4) forming the inner wall surface of the storage, the cold room (5) is arranged. The downside sets up the vegetable box (6) which a little bit is the high temperature and is maintained than the cold room by the high humidity through the parting strip (7). The downside of the vegetable box (6), the temperature switching room (9) and \*\*\* room not shown are from side to side classified through the insulation Partition walls (8) and it juxtaposes. The freezer (10) is independently arranged in bottom. The door of the respective exclusive is set up in the front surface opening part of each storage room and it closes.

Each storage room circulates the cool air with the fan (13) (14) or the duct installed at the neighborhood of the cooling device (12) for the cooling device (11) for cooling and the freezing installed at the cooling space, and each rear side of the freeze space and each cooling device. It is cold-controlled to the temperature set up each storage room.

The machine room (15) space is formed in the bottom of the refrigerator body (1) at the lower part of the rear side of the freeze space arranged. The compressor (16) supplying refrigerant to the cooling device (11) (12) for the cooling for and freezing is installed at.

In configuration, the container (19) receiving and saves the food within the temperature switching room (9) is set up. The support frame (21) of right and left pair extended to the inside direction is adhered to the internal side of the door of temperature-converting room (20) which is the side sectional view of the left side of the temperature switching room part. By the carrying box (19) being arranged between the support frame (21) and maintaining it makes free with the door (20) to the refrigerator outside with withdrawal.

It makes free about the rail (23) which forms the support frame (21) on the side wall of the inter-phase person (4) by being done by the configuration of the support frame (21) of right and left pair forming L person feature (21a) (21b) on edge part of upside and downside end and the pulley (22) which installs at the side wall of the front side around opening part of the refrigerator body (1) receiving the horizontal of L person feature (21b) of bottom, with sliding. The flange (19a) formed on the top edge of the container (19) is supported in L person feature (21a) of the upper end.

Each backend outside of right and left support frame (21), the pulley (24) is fixed in order to slide the rail (23) in of right and left. By arranging within the frame formed into the inner surface of the door of temperature-converting room (20) and support frame (21) of right and left the receiving container (19) is steadily maintained.

In the upper side opening of the carrying box (19), the cover (25) formed into the size which completely covers opening is arranged. In order to have interval with the added influence to the upward of the spring (26) about the opening of the container (19) generally the cover (25) hangs with the extension spring (26) adhered to different shops of the indoor ceiling side.

If it is the lower of the cover (25) corresponding on the top of the flange (19a) of container, in order to when the cover (25) covers the opening of the container (19) with attachment, and configuration which will be described later, it removes and the seal packing (27) contacts with each other with the upper side of the flange (19a) the container is sealed up the seal packing (27) of the hook shape formed into the silicon rubber etc. in edge is formed.

The upper front of the cover (25) which is the main part sectional view at the state closing down, the lid opening instrument (28) is set up. Hang and fit door open and close operation with the guide (29) having the rod shaped body through-hole (29a) in which the lid opening instrument (28) is made of the rod shaped body, and which supports one shift on the top of the door of temperature-converting room (20) and which hangs and fits, and which makes free with rotation of up and down and which extends the other end as indoor and which sets up the cover suppressor (28a) in the leading end, and set up in the ceiling portion of the indoor front side of the door of temperature-converting room (20) neighborhood, the suppressor (28a) of the other end is moved up and down with movement.

As shown in Figure 4, the lid opening instrument (28) is drawn out for the high outside in the door open with the door (20). However, by hanging and fitting with the through-hole (29a) of guide, the suppressor (28a) of the other end moves to the upward like arrow and the cover (25) the power repressing to downward is canceled. Therefore, in order to move to the upward with the return force of the spring (26) and the upper side of the container (19) is opened guide operates. The cover (25) remains in indoor in case of drawing out the door of temperature-converting room (20) from the front with this configuration. It is drawn out from the state that it opens the upper side only the container (19) for the refrigerator outside.

According to movement to the other end of the lid opening instrument (28) with the guide (29) is the inner side direction hang and fit in the movement to the indoor inner side of the carrying box (19) by the door closing action, it downwards aims. It acts so that the leading end suppressor (28a) repress the upper side of the cover (25) and the opening of the carrying box (19) is closed. The opening is comprised in order to completely seal up the carrying box (19) in the door closed state with the seal packing (27).

And in the rear part of the cover (25), it opens so that cover is inserted and is passed and the one shift be positioned within the container (19). The other end is downwards extended and the exhaust pipe (31) consisting of the flexible material of the inner pressure structure connected to the vacuum pump (30) is installed.

The vacuum pump (30) is adjacent to the compressor (16) within the machine room (15) and it is installed. By automatically instructing to handle according to the necessity to maintain the food the pressure reduction as the manual it is driven. It is driven after the fixed time passage after the door of temperature-converting room (20) is closed in drive. In order to inhale the air within the container (19) shut tightly with drive through the exhaust pipe (31) and the container is reduced pressure the air acts. It is preferable that the vacuum pump (30) has the food conservation as purpose and purpose has. It uses the thing of the ratio oil in moreover, the management aspect.

The pressure in the pressure reduction within the carrying box (19) could diversify with the aperture degree of the intake period of the vacuum pump (30) or the exhaust pipe (31). However, it set up in case of this embodiment in 50 as the designated value between 200Torr. That is, the amount of oxygen within container can be done with 10% this harrow of the amount of oxygen under the atmospheric pressure is the upper pressure if it makes the pressure within the carrying box lower than 200Torr. Therefore, the absorption of the oxidation progress of the food or the garden stuff can be effectively suppressed. It thus accompanies and the thing of the inner pressure structure which is suitable for the decompression force is used the use of an instrument (19) and the cover (25) in which the closure structure is.

In the meantime, the sealing pack food including the Retort Food etc. is received erroneously sealed by heat to do pressure within container over 50Torr erroneously, the pack food is possible to burst with the pressure reduction if it becomes pressure with 50Torr less than edge. It respects to prevent their bad effect.

Moreover, the pressure within the carrying box (19) controls so that the drive of the vacuum pump (30) be stopped if the pressure has in range of the designated value. Simultaneously, until it becomes again pressure with the drive of the vacuum pump (30) with 200Torr less than edge in case pressure is enhanced with the enclosing of the food to the carrying box (19) or extraction within container than 200Torr, the air is inhaled, the air does. The actuating time of the vacuum pump (30) for the food conservative environment by the low oxygen concentration is to the utmost shortened with the control of driving and the consumption of the energy is controlled.

It illustrates for the operation of configuration. Generally, in the cooling driving time of refrigerator, the door of each storage room is shutted. The cool air by the cooling device (11) (12) for the cooling for and freezing are circulated in the cooling fan (13) (14) through duct to each storage room and this is cooled.

The temperature switching room (9) is the small thread converting into the preset temperature of the multifariousness from the refrigerating temperature of  $-20^{\circ}\text{C}$  to the chilled, cooling, and the whine storage temperature of about  $+8^{\circ}\text{C}$  and vegetable storage temperature. The cool air from the cooling device (12) for freezing is introduced to the surface of the cold room door (34) with the manipulation of the operation panel (35) set up with the damper control. The food within the carrying box (19) set up in indoor is and maintains refrigerated to the preset temperature of desire.

Therefore, with the vacuum pump (30) not running in case of using as the normal cooling conservation transition room which does not preserve the temperature switching room (9) after decompression, the cover (25) is to the state opened with normal times and the cool air is introduced within the container (19) and it circulates and it

cools. Moreover, it may be acceptable that in the cover (25), in order to close opening and the high humidity is maintained with the indirect cooling from the surrounding of the container (19) it cools.

The upper side opening of the carrying box (19) at indoor is shut tightly by the cover (25) in case of specification setting the temperature switching room (9) the reduced pressure storage room Indian millet. The long-term preservation of the food having to the suction of the air from the exhaust pipe (31) by the drive of the vacuum pump (30) in the decompression state and does not cause the suppression of the absorption of the oxidation blocking of the meat of fish maintenance or the garden stuff etc. with the low oxygen concentration of the interval of 50~200Torr is planned within the container (19).

In this state, in case of opening the door (20) of the temperature switching room with withdrawal, it withdrawal to the front of the door (20) accompanies and the lid opening instrument (28) is drawn out for the refrigerator outside. Then, the cover (25) is opened with the spring (26) power with the upward since the oppressiveness of cover to downward is removed. The container (19) returns inside in the atmospheric pressure. Simultaneously, since it is drawn out from the state opening the upper side for the high outside only the container (19), it is troublesome, it can extract in the opening operation of the vessel shell by the pressure reduction as the enclosing of the food. Moreover, the container (19) the cleaning or the washing of container is facilitated from the door (20) and support frame (21) since being separable.

When the enclosing extraction operation of the food terminating and again closing door, the lid opening instrument (28) the leading end of the rod shaped body moves to the inside refrigerator inside direction with the door closing action. It downwards aims by at the same time hanging and fitting with the guide (29). The leading end suppressor (28a) resists the spring (26) power and the upper side of the cover (25) is repressed. The opening of the carrying box (19) is closed with sealing. Simultaneously, if since the vacuum pump (30) operates the internal air of the container (19) is inhaled, it reduces pressure to the predetermined pressure value, the suction action is stopped and door maintains.

At this time, with maintaining the high humidity with the indirect cooling if it forms into the good heat conduction materials of the steel sheet etc having the rigidity which the carrying box (19) is the tightness state and cooling is indirectly performed from the surrounding of container, and however, endures the material of container against the pressure reduction it is good, the food of inside can be cooled.

Next, it illustrates for another preferred embodiment of the present invention. In the above preferred embodiment, by operating with the operation of the guide (29)) and lid opening instrument (28) in the door opening of the door of temperature-converting room (20) and opening the cover (25) of the carrying box it returned to the atmospheric pressure. However, by convex using the circulation by tool, the steering wheel (33) of the drawout door (20) of the temperature switching room adhering the same symbol to the same part as above statement example is decided on to the configuration of opening door in \*\*\*. The leak valve (leak valve) (35) opening the through hole (34) with the outside which sets up in the cover (25) with the circulation of the steering wheel is connected. In that way it has the door open operation by the steering wheel (33) as signal and at the same time, the through hole (34) of cover can be opened with the leak valve (35). The container (19) is returned to the operation of moment to the atmospheric pressure. The carrying box (19) is rapidly in the door open to the atmospheric pressure by tool and it makes the opening of the cover (25) facilitated.

Moreover, although not illustrated, the open valve of the electronic is specially mounted to the cover (25) of container. Even if valve is opened with the suppression of the manual switch set up in the surface of the drawout door (20) and it returns in the atmospheric pressure, is of course. What good.

In the above preferred embodiment, it performed the seal of the carrying box (19) with the cover (25) set up in the upper side opening. It performed the return to the atmospheric pressure with the through hole (34) set up in cover. However, the through hole is not restricted to installation to cover. Therefore, the drawout door (20) and carrying box (19) are adhered closely. It is good even if the through hole is formed on the door (20) surface. However, in order that it prevents from the refrigerator outside air of the room temperature breaking within the carrying box and the temperature of the food rising with the leak operation which becomes wrong, the through

hole for leak forms within the temperature switching room (9). It is good in opening to introduce the cool air to inside.

Moreover, in the above preferred embodiment, it may be acceptable that the lid opening instrument (28) was connected in opening and shutting of the door (20) of the temperature switching room. However, it does not connect in consulting opening and shutting and as shown in Figure 7, the solenoid (40) is arranged on the top of the cover (45). It is good as for the relation of conducting to the solenoid (40) and spring (46) including the door switch signal etc. not shown even if the on-off control of the cover (45) about the container (39) is performed. It has the opening of the container (39) as the openness and the designated time after the door closure, for example, for 30 minutes introduces the cool air within container. After the food is cooled to the prescribed temperature, it resists the elastic force of the extension spring (46) and the cover (45) is repressed to the protrusion ability of the operation bar] (41) by conducting to the solenoid (40) from the upward and as shown in Figure 7, the opening of the container (39) is shut tightly. The vacuum pump (30) is run thereafter and the container is reduced pressure to the prescribed input, for example, 100Torr.

Moreover, it may be acceptable that it moves the cover (45) up and down with the engage movement of the pinion gear (47) by the motor driving and rack (48) and it opens the upper side opening of the container (39) or as shown in Figure 8, opening and shutting of the cover about the carrying box close besides configuration.

In this way, it is depressurized after the food within the carrying box (39) cooling to the prescribed temperature. Therefore, the bad effect injuring the cooling action is done not have from the deterioration of the heat conduction by the indirect cooling at the decompression state and the longer-term conservation among the low oxygen atmosphere becomes possible.

Moreover, in the above preferred embodiment, it may be acceptable that it illustrated with the example setting up the reduced pressure storage room in the temperature switching room (9). However, it is not restricted and the independent compartment is formed and it applies within the other storage room including 1 compartment of a part of the cold room (5) or the freezer (10) etc.

#### ■ Effects of the Invention

As described above, according to the configuration of the present invention, with cooling, the carrying box is the stores received in the reduced pressure storage real estate depressurized in directly in other words. Then, the food and the oxygen which receives and preserves in order to lower the oxygen content among the decompressive atmosphere can be blocked. The suppression of the absorption of the vegetable, the inhibiting oxidation of the keeping light, and the suppression of the enzyme activity and activity suppression of the aerobic microorganism are possible. The freshness of the enclosing stores is sustained and it can preserve for a long time.



#### Scope of Claims

Claim 1 :

Refrigerator wherein the freezing storage and cold storage space, and these storages and the reduced pressure storage space independently cooled by the cold air current are created; the shutable carrying box is arranged within the storage and it makes the indirect cooling by the direct cooling by the cool air inflow or the seal possible; and the air of the space inside part is exhausted when being done by the enclosure, it makes it possible to do to the state.

Claim 2 :

Refrigerator of claim 1, wherein the upper side opening of the carrying box is shut tightly with the cover adhered to the ceiling portion of the reduced pressure storage space; and the exhaust hole of the decompression means is set up in cover.



Claim 3 :

Refrigerator of claim 2, wherein it moves up and down according to consulting opening and shutting setting up cover in the opening of the reduced pressure storage space.

Claim 4 :

Refrigerator of any one of claims 1 through 3, wherein the container is reduced pressure to the prescribed input after the cooling cool air is introduced within the carrying box when closing the exclusive door of the reduced pressure storage space and cooling to the prescribed temperature.

Claim 5 :

Refrigerator of any one of claims 1 through 3, wherein the pressure within the carrying box is reduced pressure with the vacuum pump set up in the refrigerator outside and the exhaust pipe connected to this to the designated value between 50~200Torr; and the drive of the vacuum pump is stopped in case for the pressure within the carrying box, the designated value is.

Claim 6 :

Refrigerator of any one of claims 1 through 3, wherein the reduced pressure storage space is really done; and it operates with the exclusive consulting opening and the leak through hole of the carrying box is left open and it is done by the atmospheric pressure.



Drawings

Fig. 1

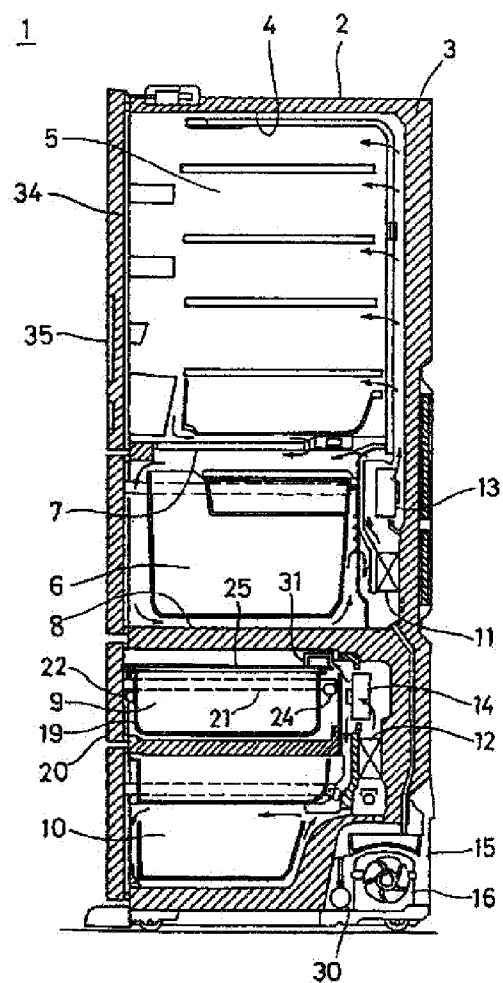


Fig. 2

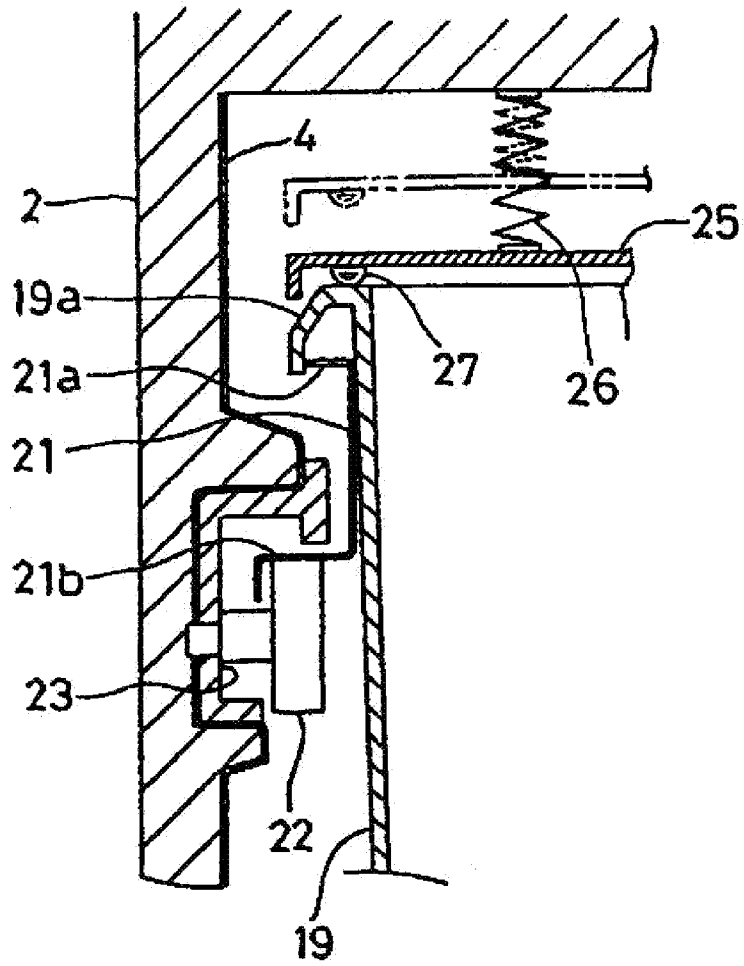


Fig. 3

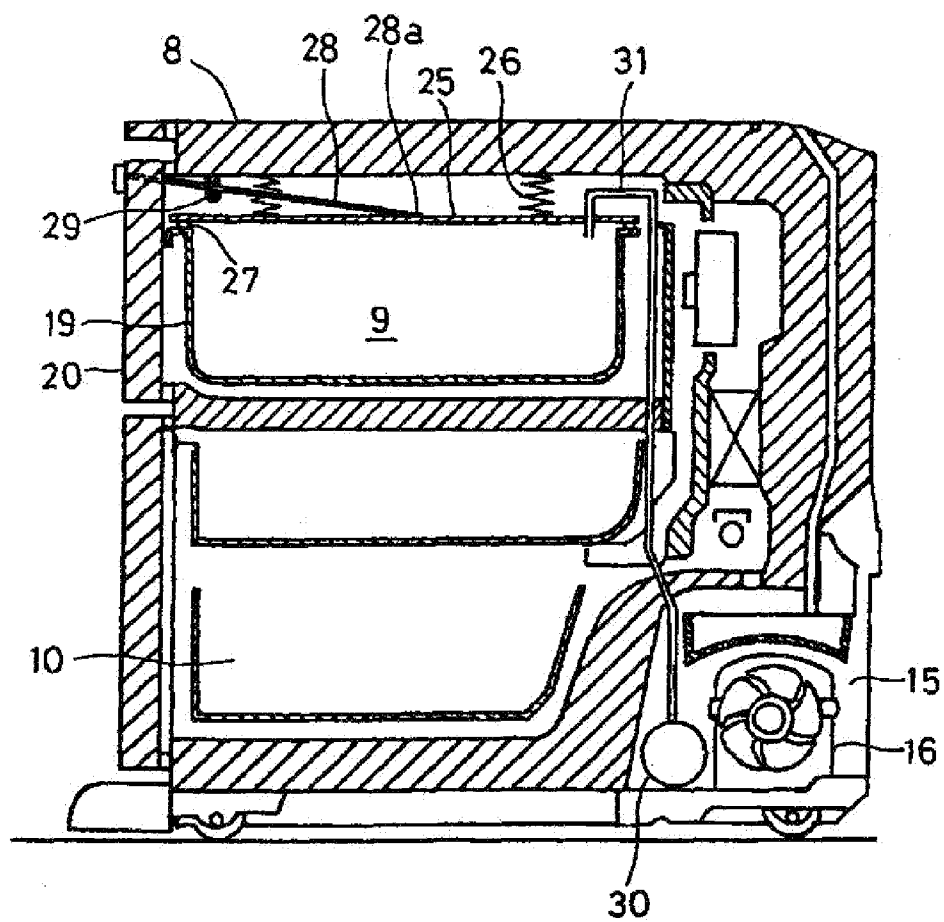


Fig. 4

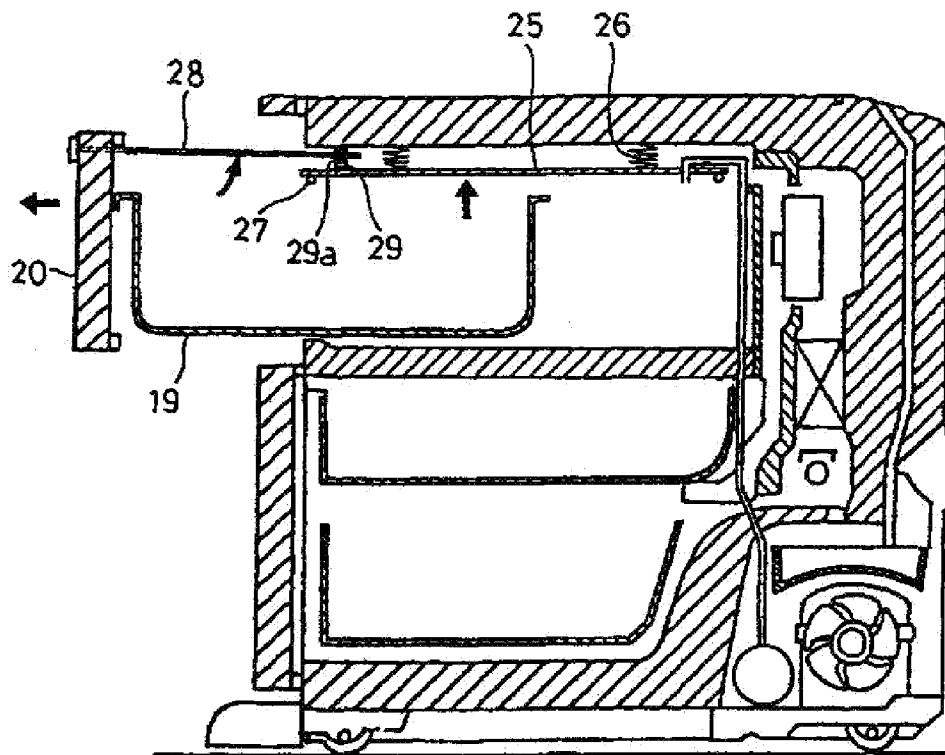


Fig. 5

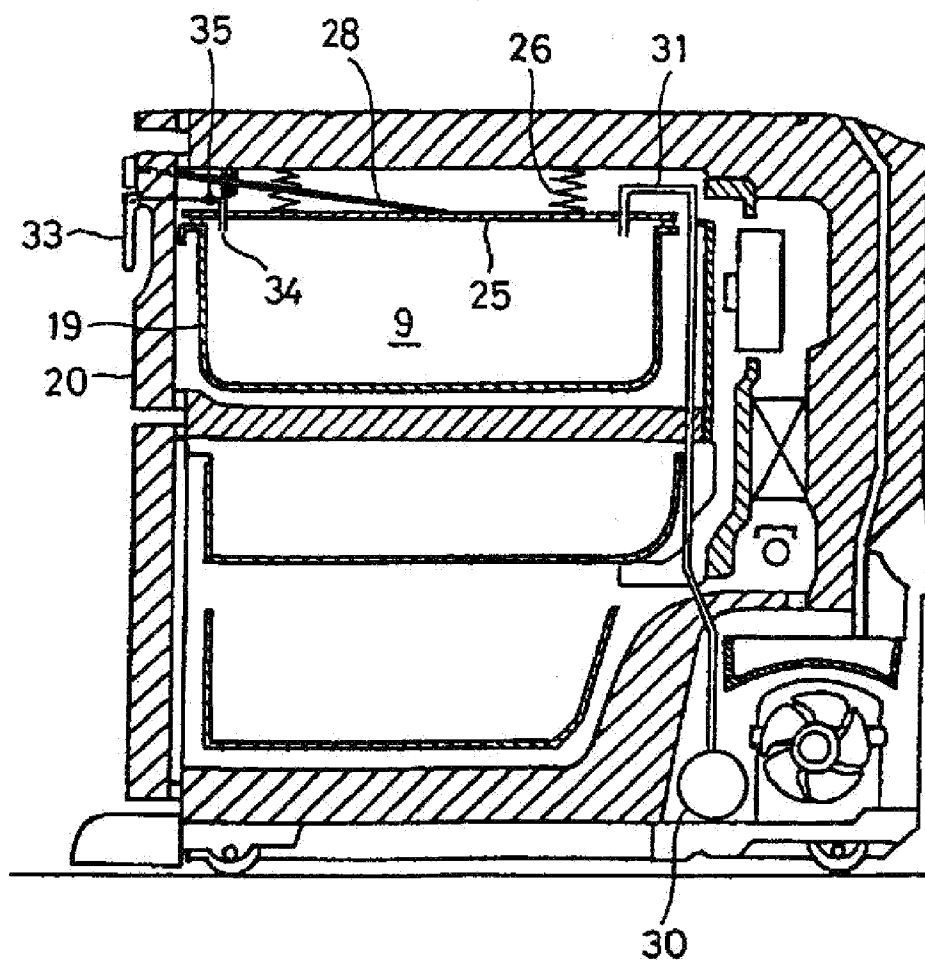


Fig. 6

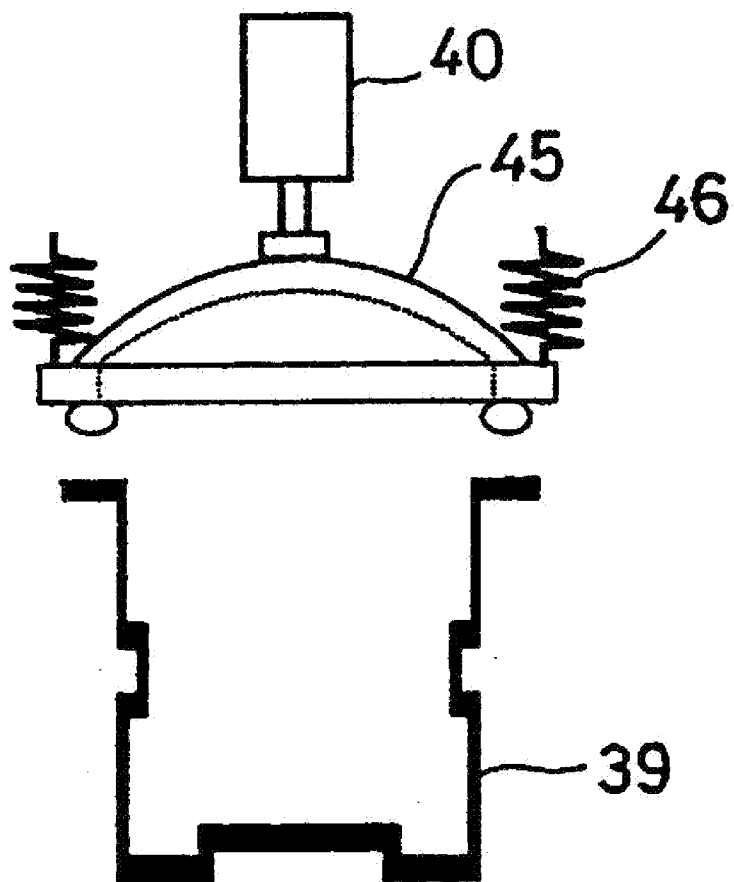


Fig. 7

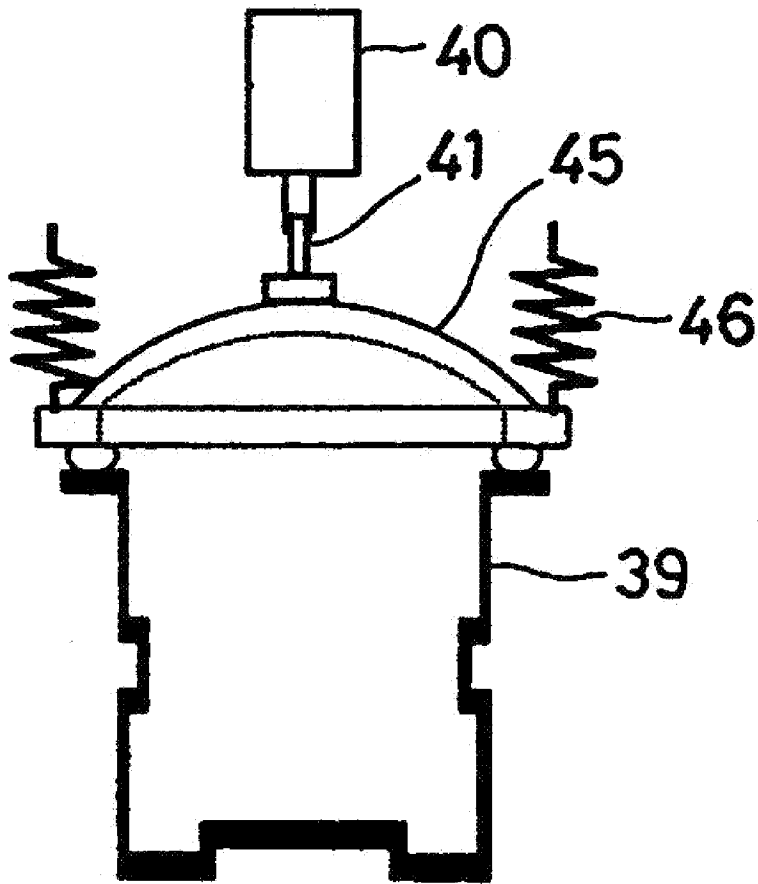


Fig. 8



